

**Statement of
Cecil Roberts, President
United Mine Workers of America
before the
Committee on Government Reform and Oversight
Subcommittee on National Economic Growth, Natural Resources, and Regulatory Affairs
U.S. House Of Representatives
June 24, 1998
The Economic Consequences of Climate Change**

Mr. Chairman and members of the subcommittee, I appreciate the opportunity to share with you our views on the economic consequences of the Kyoto Protocol¹. The United Mine Workers of America became involved in the climate change debate because of concerns about the effect of the treaty on coal miners' jobs. We have participated in every negotiating session at the United Nations for the past several years. The UMWA has spent a considerable amount of time trying to understand the economic implications of the Kyoto Protocol. Based on extensive economic analysis, we have become convinced that the effects of the protocol go far beyond impacts on the coal industry. We believe that the Kyoto Protocol will have serious negative effects on U.S. jobs, economic growth, family incomes and trade, but will have almost no positive effects on carbon concentrations.

The Kyoto Protocol calls upon the United States to reduce emissions of a basket of six greenhouse gases 7% below 1990 levels by 2008-2012. Greenhouse gases subject to controls under the protocol are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF₆). Carbon dioxide comprises about 85% of the volume of U.S. emissions of greenhouse gases, although

¹ Data presented in this testimony are derived from "The Impact of Meeting the Kyoto Protocol on Energy Markets and the Economy," June, 1998, prepared for the UMWA-BCOA Labor Management Positive change Process (LMPCP) Fund by Standard & Poor's DRI.

some of the other gases have higher global warming potentials. The Kyoto agreement contemplates the use of market-based mechanisms such as emissions trading among Annex I countries', Joint Implementation (JI) projects among developed countries and a Clean Development Mechanism (CDM) for project-based emission reductions in developing countries to minimize the cost of compliance.

The protocol implies that the United States will have to reduce its emissions of greenhouse gases by approximately 500 million tonnes of carbon equivalent in the 2008-2012 period. This represents a reduction of about 30% from business as usual in the compliance period. Assuming that the cap on emissions remains through 2020, emissions would have to be reduced about 35% below Base Case levels. Although the post-2012 obligations are undefined, if the U.S. maintains this emissions target, reductions will be 640 million tonnes by 2020. The U.S. could meet its obligations through a combination of lower fossil fuel use, reductions of gases with higher global warming potentials, enhancement of sinks, emissions trading with other Annex I parties, JI projects, and through CDM projects with developing country parties.

Although the rules have not yet been written for the market-based mechanisms, the analysis we have conducted assumes a generous amount of U.S. reliance on these mechanisms. Table 1 below shows the assumed U.S. reductions and the offsets from the other market mechanisms. The analysis assumes that the U.S. must reduce emissions by an average of 497 million tonnes of carbon equivalent in 2008-2012. Of this total 207 million tonnes, or about 42%, comes from other gases, sinks, trading, JI and CDM projects. The remainder, about 290 million tonnes, is derived from domestic actions, such as energy conservation and switching away from carbon-intensive fuels.

There are several factors that lead us to believe that these assumptions are generous. First, the marginal cost of control in the United States is likely to be less than that of other Annex

² Annex I countries include the United States, Canada, Australia, New Zealand, Japan, nations of the European Union, and emerging economies in eastern Europe and the former Soviet Union.

I countries, since the U.S. is relatively less energy efficient than Europe and Japan. Thus, these countries are likely to set the clearing price for trading emissions. Obviously, if Japan or the EU bids up the price of allowances above the cost of domestic control then reductions will occur domestically. Clearly, Japan is moving ahead with its plans to trade. Russian President Boris Yeltsin and Prime Minister Ryutaro Hashimoto signed an agreement in April to begin feasibility studies on twenty joint implementation projects.

Second, several parties have expressed concern about the role of these market-based mechanisms in compliance. Chairman Estrada³, the European Union, the Group of 77 and China, and environmental organizations all have recently made public statements that indicate they are uncomfortable with the notion that the U.S. may achieve significant portions of its reductions off-shore. At the most recent UN. negotiating session in Bonn. Germany earlier this month it became clear that these parties intend to restrict the amount of trading that can be used to comply with the reduction obligations. While the U.S. took the position that there should be no limits on trading, the EU tabled a paper that would require that the majority of reductions occur domestically. The Group of 77 and China took the position that trading and other flexible mechanisms were intended under the protocol to be a supplement to domestic action, not a substitute for domestic reductions. Chairman Estrada expressed his concern about creating a “commodity” of pollution rights. And finally, a number of environmental organizations took the position that trading should be limited to 10% to 30% of any country’s reduction effort.

As I said our analysis assumes considerable use of trading and the other flexible mechanisms to achieve U.S. compliance. This assumption may be overly optimistic, because if this coalition forces a limitation on the amount of emissions trading that can be used to achieve compliance, the costs in the U.S. will escalate dramatically.

³ Ambassador Raul Estrada Oyeda, the representative of Argentina, chaired the negotiations that led to the Kyoto Protocol.

Table 1
U.S. Required CO₂ Reductions and Offsets
 (Million Tonnes of Carbon Equivalent)

Year	2008	2009	2010	2011	2012	2015	2020
Gross Reductions	458	478	497	519	531	591	643
Other Gases	-20	-20	-20	-20	-20	-20	-20
Sinks	-40	-40	-40	-40	-40	-40	-40
Trading & JI	-132	-127	-121	-113	-112	-98	-79
CDM	-23	-24	-25	-26	-27	-30	-32
Net Reductions	243	267	291	315	333	404	471
Percent of Gross	53%	56%	59%	61%	63%	68%	73%

Where Will the Offsets Come From?

Only the former Soviet Union states and eastern European nations have immediately available excess emissions, with Russia and Ukraine holding the largest share. This results from the collapse of the economies of these countries following the breakup of the Soviet Union. Environmental groups have dubbed these excess allowances “hot air” and are pressuring the delegates to prohibit trading of such hot air emissions. Our analysis estimates that these countries combined will have 193 million tonnes of excess emissions available for trading in 2008, declining to 34 million tonnes in 2020. Therefore the selling parties will be the nations of the former Soviet Bloc, particularly Russia. The buying nations will include the U.S., Canada, Australia, New Zealand, Japan, and possibly the nations of the European Union.

Interestingly, Russia issued a draft analysis in Bonn that speculated that it may have no immediately available excess emissions for trading. The Russian paper stated that emissions were 3.04 billion tonnes of CO₂ equivalent in 1990, falling to 2.15 billion tonnes in 1994. The

paper goes on to state that “in 2010, under extensive economic recovery, emissions will return to about 3 billion tonnes CO₂-equiv./yr. Thus, all Russian emission trading potential may be eliminated by business as usual extensive development.” Whether this proves to be factual or is just a preliminary negotiating posture to bid up the price remains to be seen.

Carbon Permit Prices and Energy Prices

Carbon permits will act like a carbon tax on the economy. Whether imposed directly by the government in the form of a tax or by the market in the form of permit prices, end-user energy prices will rise, and the increased costs of doing business will ultimately be passed on to consumers. Table 2 below shows the percentage price increases for several important forms of energy.

Our economic analysis assumes that the carbon permit program is gradually phased in beginning in 2000 to ease the price shock to the economy. Carbon permits are granted to businesses by the federal government, rather than auctioned. The carbon permit price necessary to achieve the required reductions (in 1997 dollars) is \$100-130 per tonne, if the assumptions outlined above for trading, JI, CDM, sinks and other gases are achieved. If these market mechanisms are restricted by the treaty, carbon permit prices are likely to increase to the range of \$150-200 per tonne, and end-user energy prices will increase proportionately.

Table 2
Real Energy Prices
Percent Above Base Case

Year	2008	2009	2010	2011	2012
Gasoline	15.7%	17.2%	18.2%	18.8%	19.6%
Natural Gas	24.6%	26.1%	27.9%	30.0%	3 1.2%
Electricity	32.2%	34.5%	36.6%	38.6%	40.0%

All forms of fossil energy will experience price increases. Gasoline prices are projected to increase 21-27¢ per gallon over the base case in the 2008-2012 period. Residential natural gas prices are projected to be \$1.47- 1.89 per million Btu higher in 2008-2012, and electricity prices are projected to be 1.82-2.41¢ per kilowatt-hour higher than the base case.

The Economic Cost of Kyoto

Achieving the required reductions in carbon emissions will require substantial investments by both businesses and consumers to improve energy efficiency and to substitute lower-carbon sources of fuels for higher-carbon fuels. These investments will result in the diversion of funds from savings or investment in other things, such as housing, education or health care.

Numerous economic analyses, including some draft analyses by the Clinton Administration, indicate that efforts to meet the obligations arising out of the Kyoto protocol will be quite costly. Over a million American jobs could be lost, and the losses will occur in every region of the country. Among those most affected are coal miners, utility workers, railroad workers, aluminum workers, paper workers and cement workers. Nearly every sector of the economy, including service industries and state and local governments, could be affected. The loss of high paying mining and manufacturing jobs, along with the general decline in other jobs, will lead to a severe reduction in wage growth, further exacerbating the widening disparity of wealth in America. And greenhouse gas reduction efforts are likely to increase the U.S. trade deficit as exports of U.S. goods decline and imports increase.

The loss of real GDP would be significant under the proposed Kyoto Protocol. Based on the trading assumptions outlined above, the decline in GDP would be about 1.2% on average in the 2008-2012 compliance period. This represents economic losses in excess of \$100 billion per year, and cumulative losses from 2001 to the end of the initial compliance period in 2012 would

be about \$1.1 trillion. Cumulative losses would continue to grow beyond the initial compliance period, assuming that the emissions cap is maintained post-20 12. While 1.2% may sound like a small price to pay, one can get some sense of the magnitude of these losses when measured against common federal expenditures. For example, the U.S. government spends a similar amount each year on transportation, community and regional development, education, training, employment and social services. We spend only about twice that amount each year on Medicare. And it is about half of what we spend each year as a nation (combined federal, state and local expenditures) on elementary and secondary education. Clearly, the costs of Kyoto are large and significant.

Another way to measure the magnitude of the economic losses is to consider them on a per-person or per-household basis. Our analysis indicates that GDP losses would exceed \$400 per person in 20 10 and GDP losses per household would be nearly \$1,200 in the same year. Cumulative GDP losses from 200 1 to the end of the initial 20 12 compliance period would be over \$4,000 per person and nearly \$12,000 per household.

As energy prices increase and our economy slows, jobs will be lost. Our analysis indicates that implementation of the Kyoto Protocol would result in the loss of nearly 1.3 million jobs in 2005. Job losses are expected to occur in every region of the country and in every sector of the economy, with the exception of the federal government. From a regional perspective, the interior regions of the country will be hit the hardest. This is because of their heavy reliance on fossil fuel production and consumption. For example, while coal is used to generate about 56% of electricity nationwide the share of coal-fired electrical generation is much higher in the nation's heartland. In addition, the interior regions of the country tend to rely much heavier on energy-intensive industries for economic activity than the coastal regions. Therefore, the burden of the reduction obligations fall more heavily on the interior than on the coasts. Nonetheless, every region of the country will experience a loss of economic output and jobs.

Job losses are also expected to occur in every sector of the economy. Industries

associated with high-carbon fuels such as coal mining and coal-fired electricity are hit especially hard, but the impacts are much broader. Job losses will occur in construction, manufacturing, transportation and public utilities, services and state and local governments.

As job losses occur and wage growth is constrained, families will lose income. Our analysis indicates that the nation will lose in excess of \$115 billion per year in real disposable income. Over the initial 2008-2012 compliance period, there would be a cumulative loss of \$600 billion in lost real disposable income.

One aspect of this debate that needs much more attention is the regressive distributional effects of higher energy prices. Energy taxes are highly regressive by nature. Regardless of income, families must heat and cool their homes, cook their food, wash their clothes and travel to work. For example, the U.S. Department of Energy estimates that a family with an annual income of less than \$10,000 still spends nearly \$1,000 per year in energy costs in the home. Energy taxes, or equivalent carbon permit schemes, will be crushing for low-income workers and seniors living on fixed incomes. There needs to be more analysis of the distributional effects of greenhouse gas reduction policies.

The Environmental Impact of Kyoto

Despite the substantial economic costs, the Kyoto Protocol will accomplish almost nothing environmentally. Dr. Bert Bolin, former head of the U.N. Intergovernmental Panel on Climate Change (IPCC), recently wrote in *Science* magazine that if we do nothing global concentrations of carbon dioxide will be 383 parts per million (ppm) in 2010. With full implementation of the Kyoto Protocol, carbon dioxide concentrations will be 382 ppm. In other words, over a million workers could lose their jobs, and the nation could spend over \$100 billion per year for a treaty that will reduce carbon dioxide concentrations by only one part per million in 2010.

The reason that Kyoto will have almost no effect on carbon concentrations is because nations that will soon emit more than half of the world's greenhouse gases are exempt from any reduction obligation under the treaty. The fast-growing developing economies in China, India, Mexico and elsewhere will offset reductions made in the United States and other Annex I countries.

The Role of Developing Countries

Mr. Chairman, as you know the U.S. Senate unanimously adopted last year Senate Resolution 98, which called upon the President not to accept a treaty that did not include commitments from developing countries. President Clinton last October said that the U.S. would not take on legally binding emission reduction obligations unless there was "meaningful participation from key developing countries." The Kyoto Protocol contains no such commitment from developing countries.

No progress was made on this issue in the recent Bonn meeting. Developing countries, led by China and the G-77, vociferously opposed including any discussion of developing country commitments on the agenda for the Buenos Aires meeting of the Conference of the Parties (COP-4) this fall. China even opposed any discussion of voluntary commitments by developing countries. A provision for such voluntary commitments was deleted from the Kyoto Protocol during the final days of negotiations last December, and it is clear that China intends to keep it off the table.

Coal and the American Economy

Mr. Chairman, if I might I would like to spend a few moments talking about the issue that led us to become involved in the international climate change negotiations--the effect on the coal industry. Almost every analysis we have seen concludes that the coal industry will take a severe hit from efforts to reduce greenhouse gases. A number of environmental organizations have

expressed the view that the U.S. could reduce greenhouse gas emissions “simply” by replacing coal in our electric utility grid. While this is true in theory, it could not be accomplished simply, or without significant cost. Coal provides the fuel for some 56% of U.S. electricity generation, by far the single largest source of electricity. In some regions of the country, coal provides about 75% of electricity generation. Replacement of this amount of generating capacity would take an enormous amount of capital investment, and create issues of stranded costs that would dwarf the ongoing debate on electricity deregulation. Aside from the capital costs, where would we find the fuel to replace more than half our electricity output? Nuclear power is unable to take up the slack since most nuclear plants operate at high capacity. Moreover, many nuclear power units are nearing the end of their operating licenses. Hydro power is unlikely to pick up any demand since we have no ability to expand hydro generation. Indeed, in western states there are attempts to tear down hydro-electric dams and let the rivers go back to their original state. Other renewable technologies, like wind and solar power, have made little inroads into the national electricity grid.

That leaves natural gas as the only reasonable substitute for coal. But we must question how reasonable. Natural gas currently costs about twice as much as coal. While coal prices are stable and fairly predictable, that may not be the case with natural gas. Wholesale conversion from coal to gas would raise questions of both supply and price. Do we have enough natural gas to make such a conversion? Would we be trading a domestic supply for one that inevitably will lead to greater imports? If we have enough gas, what will be the price in the short run and the long run?

Perhaps a more basic question on the minds of coal miners is what happens to them. What happens to their families and their communities should the nation decide that the product they produce is no longer acceptable for electricity generation. Coal mining is a unique industry. It is located in isolated rural areas of the country that have little or no alternative employment opportunities. For many of these communities, coal mining defines the term “one-industry town.” If the coal mining jobs disappear, the engine that drives the local economy comes to a

halt. The burdens of these policies will not fall evenly across all regions or industries. But we know that coal miners and the communities that depend on them for economic sustenance will bear a heavy burden. I think coal miners and other workers deserve an answer to their question. What happens to them?

These are questions that we believe the Congress and the American people would want to answer before we embark on a program to replace our most abundant domestic source of energy. Unfortunately, it appears that the Administration intends to implement the treaty without the constitutional obligation of submitting the treaty to the U.S. Senate for ratification. A variety of activities are underway or planned by the EPA to force utilities to switch away from coal. We believe that it is wrong to attempt to achieve backdoor implementation of a treaty that the Administration admits could not survive Senate ratification. The UMWA does not believe that the President should sign the Kyoto Protocol. However, if the Administration intends to implement the treaty, it should submit the treaty to the Senate so the American people can express their judgment on its merits.

Conclusion

Mr. Chairman, the White House has been highly critical of those who have expressed concern about the economic cost of the Kyoto Protocol. We all know that economic models--like the computer models used to project future climate trends--are limited in their ability to predict the future. We do not claim to be prescient, nor do we think that our analysis represents the only reasonable set of likely economic outcomes from compliance with the protocol. We do believe, however, that the analysis is an honest attempt to estimate the costs, not one based on overly optimistic or pessimistic assumptions.

In testimony before the House Science Committee, Dr. Janet Yellen, Chair of the White House Council of Economic Advisors, recently testified that the Administration believes that the Kyoto agreement can be implemented at a very low cost to the economy. This is based on an

assumption that 85% of the emission reductions contemplated in the protocol can be achieved through sinks, other gases and purchases of emission credits off-shore. Our analysis indicates that the costs may be much more substantial.

Surprisingly, it appears that in the absence of assumptions about the role of trading and other market mechanisms, the White House analysis and ours come to similar conclusions. When we utilize assumptions similar to those used by the Administration, the model yields similar results. In other words, it appears that we both come to approximately the same economic results before making assumptions about how much of the reduction must be achieved domestically and how much can occur off-shore. This is a guess on our part, however, because the White House will not release its underlying economic studies.

The real question is whether the White House assumptions or those used in the UMW-BCOA analysis are more reasonable. Having heard the debate on the role of trading and flexible mechanisms at the most recent negotiating session in Bonn, it is hard for us to accept that the White house assumptions represent a reasonable expectation of the outcome of COP-4 in Buenos Aires. As I said earlier, there are growing indications that the EU, the G-77 and China along with environmental groups will seek to limit significantly the role that these mechanisms can play in compliance. The more limits are placed, the higher the cost to our economy because the reductions will necessarily be made domestically, arguably at a higher cost. For example, if trading and other mechanisms are limited in our analysis to about 25% of compliance, the costs increase by 50% or more.

Vice President Gore, in his book *Earth in the Balance*, wrote extensively about efforts to combat climate change. At the time he said:

“Minor shifts in policy, marginal adjustments in ongoing programs, moderate improvements in laws and regulations, rhetoric offered in lieu of genuine change--these are all forms of appeasement, designed to satisfy the public's desire to believe that

sacrifice, struggle, and a wrenching transformation of society will not be necessary.”
(emphasis added).

Sacrifice, struggle and a wrenching transformation of society.

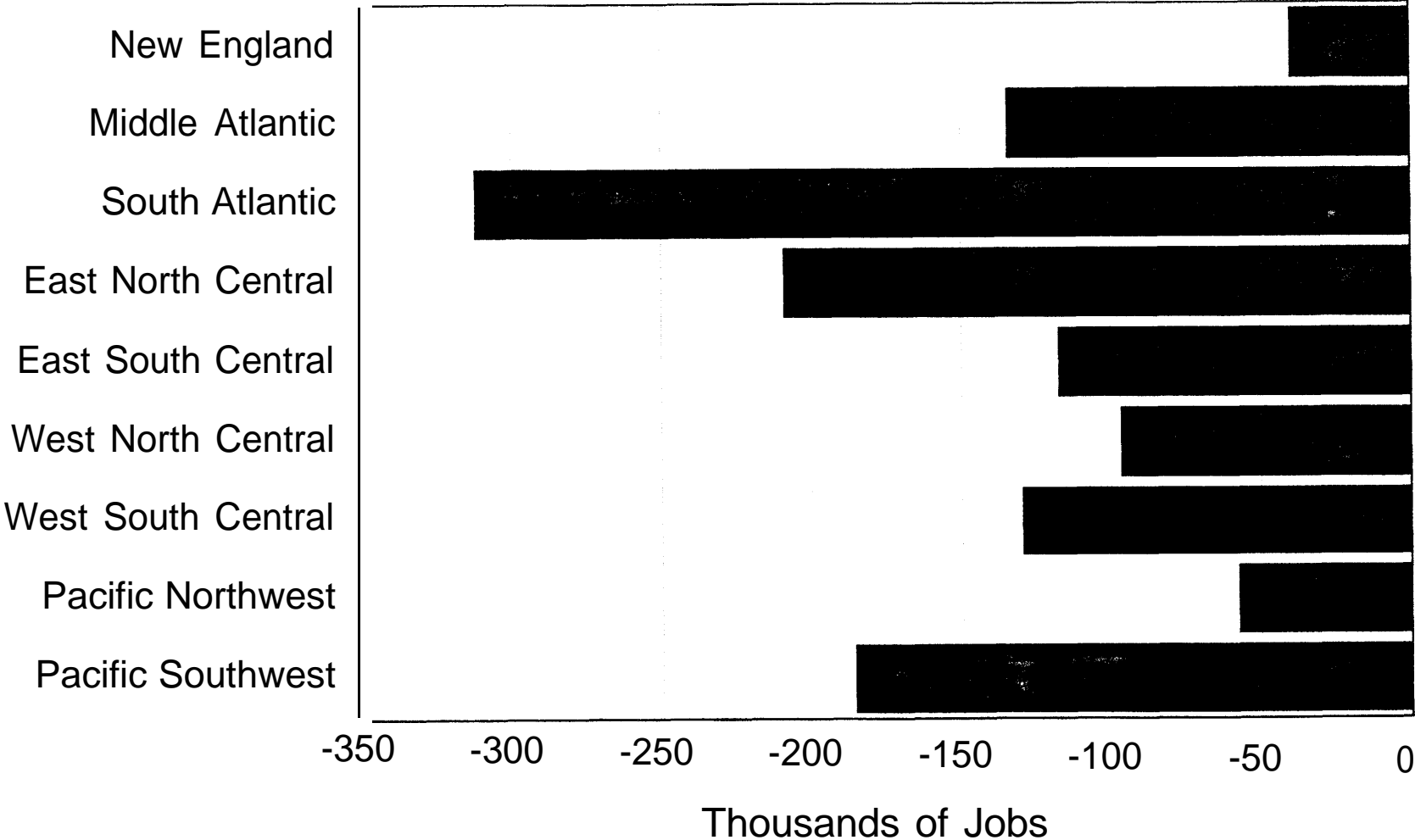
These are words that we are unlikely to hear from the White House in this debate, because they have chosen to downplay the costs by making rosy assumptions that may well prove to be false. Our analysis leads us to believe that Mr. Gore understood the costs better several years ago.

The question for the American public is whether the benefit of this policy--a decline in carbon concentrations of about one part per million--is worth over a million lost American jobs and over \$100 billion per year in lost economic output. The UMWA thinks it is not.

Mr. Chairman, I appreciate the opportunity to appear before the subcommittee. I hope that our economic analysis will add something useful to the subcommittee's consideration of this issue. I would be happy to answer any questions that you may have.

Employment Losses by Region

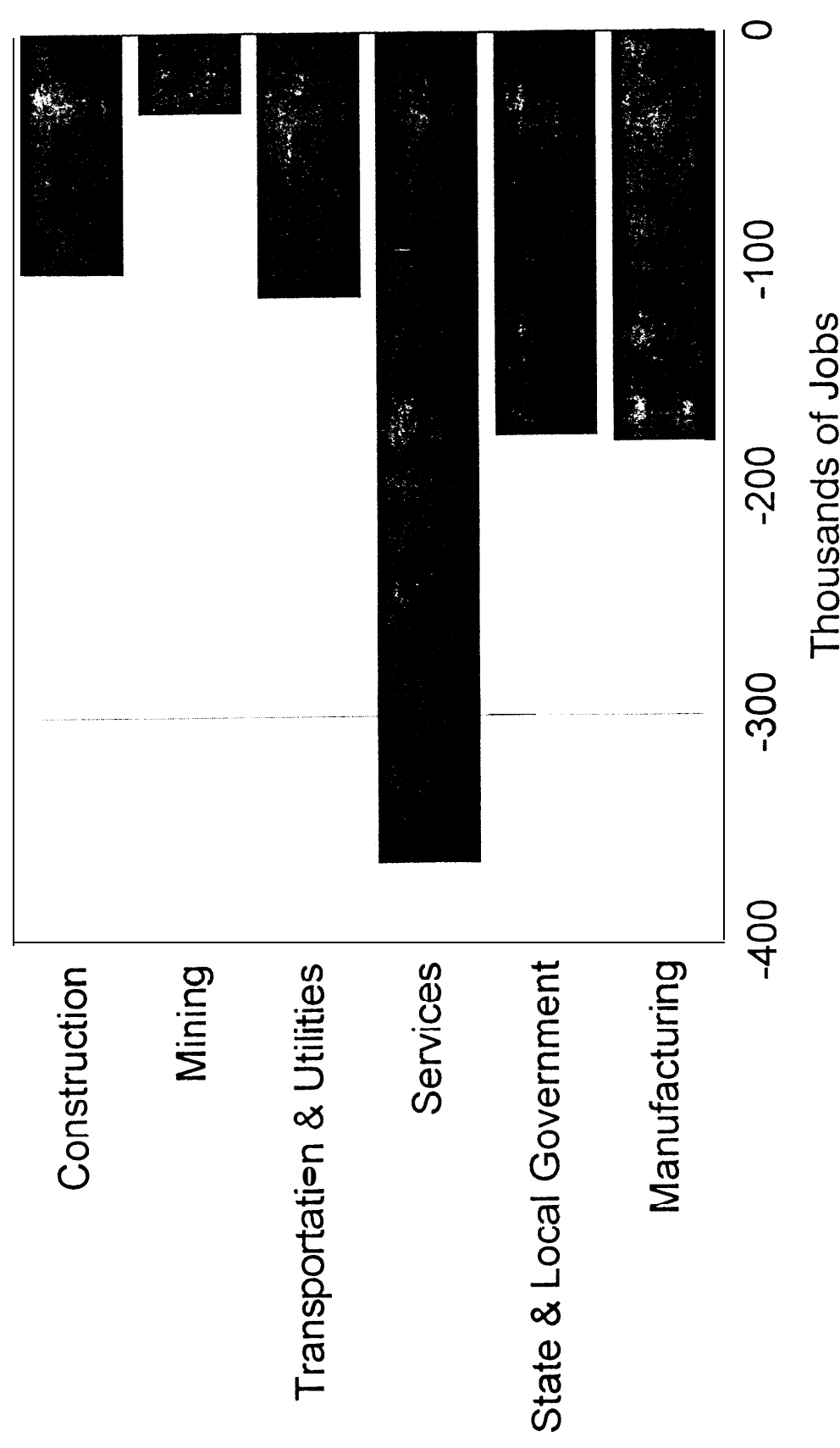
From the Kyoto Protocol in 2005



Source: Standard & Poor's DRI

Employment Losses by Industry

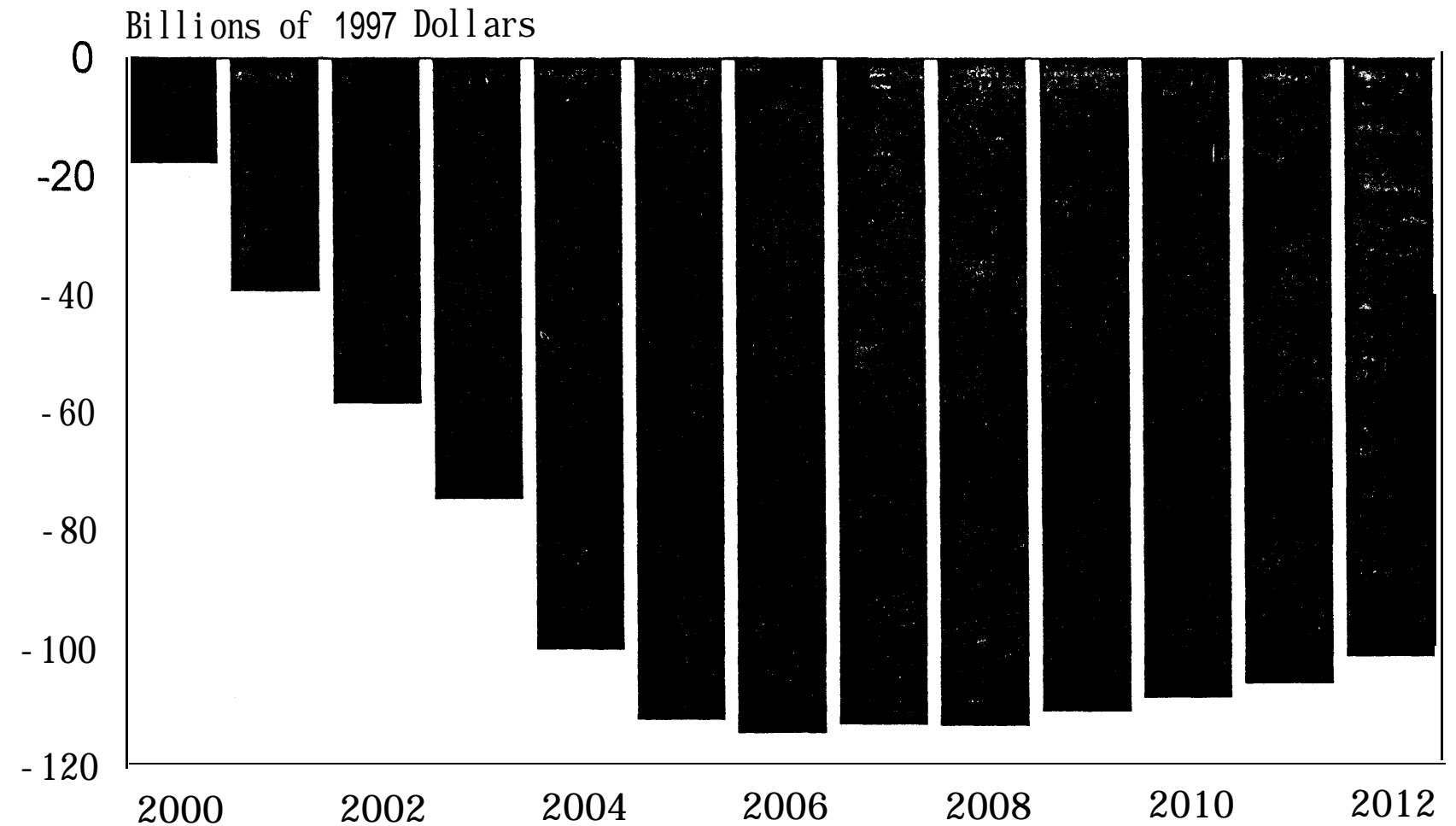
From Kyoto Protocol in 2005



Source: Standard & Poor's DRI

Annual GDP Losses

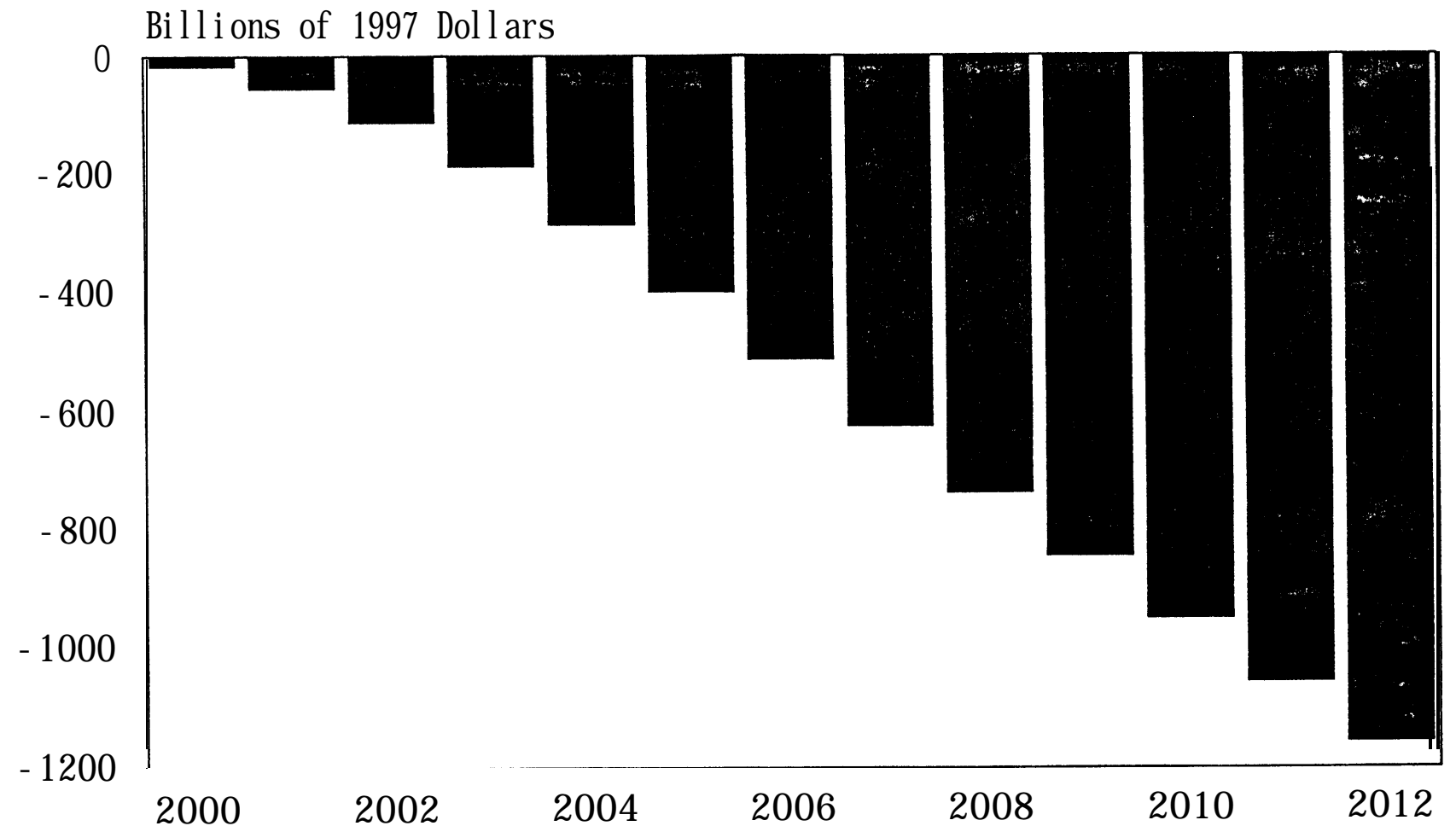
From the Kyoto Protocol (2000-2012)



Source: Standard & Poor's DRI

Cumulative GDP Losses

From the Kyoto Protocol (2000-2012)



Source: Standard & Poor's DRI

Industry Employment, Case 2 versus Base Case
Thousands of Persons

	Difference (000s)				% Difference			
	2005	2010	2015	2020	2005	2010	2015	2020
Nonagricultural Establishments	-1288.83	-1135.85	-669.4 1	-174.52	-1.0	-0.8	-0.5	-0.1
Contract Construction	-103.97	-11.31	32.27	50.36	-1.8	-0.2	0.5	0.7
Finance, Insurance & Real Estate	-2.69	16.60	22.6 1	27.26	0.0	0.2	0.3	0.3
Mining	-33.30	-60.38	-74.80	-79.83	-6.5	-12.4	-16.9	-20.3
Coal Mining	-21.10	-28.74	-3 1.05	-28.84	-24.0	-36.1	-43.6	-47.3
Crude Petroleum	-7.24	-7.14	-8.14	-5.88	-3.7	-4.1	-5.3	-4.4
Natural Gas	0.76	-12.96	-22.32	-31.15	1.0	-16.6	-29.5	-44.5
Other Mining	-6.71	-1 1.55	-13.29	-13.96	-4.1	-7.4	-9.3	-1 1.0
Transportation and Public Utilities	-114.69	-171.54	-206.15	-222.78	-1.7	-2.5	-3.1	-3.5
Total Services	-363.48	-367.44	-218.14	-38.06	-0.8	-0.8	-0.4	-0.1
Retail Trade	-232.55	-128.78	38.23	173.43	-1.0	-0.5	0.1	0.7
Wholesale Trade	-82.10	-58.30	-38.57	-32.08	-1.2	-0.8	-0.5	-0.4
Federal Government	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0
State and Local Governments	-176.17	-189.88	-86.15	52.23	-0.9	-0.9	-0.4	0.2
Manufacturing	-178.89	-164.82	-138.71	-95.06	-1.0	-0.9	-0.8	-0.6
Food and Products	-1.04	-4.21	-3.99	-0.08	-0.1	-0.3	-0.3	0.0
Tobacco Products	-0.01	-0.03	0.01	0.04	0.0	-0.1	0.1	0.4
Textiles and Products	-9.18	-10.12	-7.50	-3.05	-1.7	-2.0	-1.6	-0.7
Apparel and Products	-9.64	-11.67	-8.95	-5.42	-1.5	-2.1	-1.9	-1.1
Lumber and Wood Products	-16.76	-7.12	-1.79	1.91	-2.2	-0.9	-0.2	0.3
Furniture and Fixtures	-6.13	1.08	4 83	6.55	-1.2	0.2	1.0	1.5
Paper and Products	-6.67	-9.04	-8.92	-6.63	-1.0	-1.4	-1.4	-1.1
Printing and Publishing	-11.03	-12.86	-10.37	-5.46	-0.7	-0.8	-0.7	-0.4
Chemicals and Products	-9.84	-13.49	-13.26	-9.89	-1.0	-1.4	-1.3	-1.0
Petroleum Products	-4.01	-7.50	-9.19	-9.3 1	-3.8	-7.6	-10.5	-12.1
Rubber and Plastics Products	-7.32	-10.59	-11.35	-8.67	-0.8	-1.1	-1.2	-0.9
Leather and Products	-1.20	-1.59	-1.43	-0.86	-2.1	-3.4	-3.7	-2.6
Stone, Clay. and Glass	-8.54	-8.02	-7.50	-6.40	-1.6	-1.5	-1.5	-1.3
Cement	-0.87	-1.35	-1.61	-1.58	4.0	-6.5	-8.3	-9.0
Other Stone, Clay, and Glass	-7.67	-6.67	-5.90	-4.82	-1.5	-1.3	-1.2	-1.0
Primary Metal Industries	-11.72	-16.39	-18.58	-17.04	-1.7	-2.5	-3.2	-3.2
Aluminum	-1.59	-2.19	-2.45	-2.05	-1.3	-1.8	-2.2	-2.1
Iron & Steel	-8.71	-11.84	-13.25	-12.46	-2.2	-3.1	-3.9	-4.1
Other Primary Metal Ind.	-1.43	-2.37	-2.88	-2.54	-0.9	-1.6	-2.1	-2.0
Fabricated Metal Products	-11.81	-9.25	-8.73	-7.59	-0.8	-0.6	-0.6	-0.5
Nonelectrical Machinery	-12.86	-3.65	-0.93	-3.29	-0.6	-0.2	0.0	-0.2
Electrical Machinery	-11.51	-14.45	-17.76	-13.73	-0.6	-0.8	-1.0	-0.8
Transportation Equipment	-5.5 1	2.16	5.44	4.67	-0.3	0.1	0.4	0.3
Instruments and Parts	-0.67	0.73	4.28	4.73	-0.1	0.1	0.6	0.7
Miscellaneous Manufacturing	it.32	-4.92	-4.32	-2.80	-1.3	-1.5	-1.4	-1.0
Other Manufacturing	-4.86	-4.97	-4.06	-2.58	-1.0	-1.0	-0.9	-0.6

Exhibit 2
Impact of Carbon Permits on Industry Output, Top 25
Case 2: % Difference from Base Case, 2005

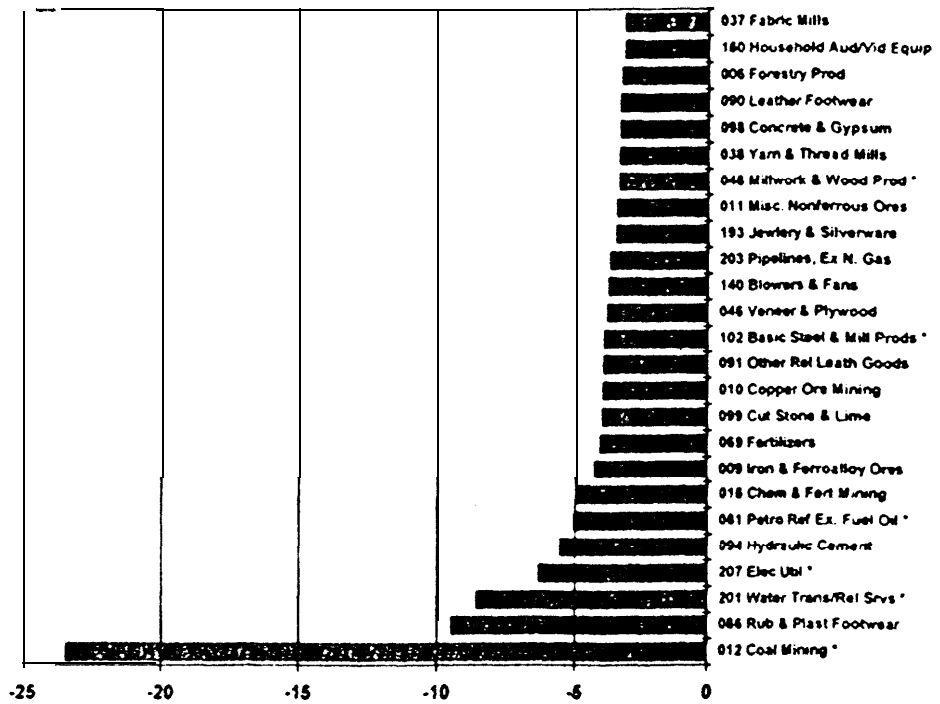


Exhibit 3
Impact of Carbon Permits on Industry Output, Top 25
Case 2: % Difference from Base Case, 2010

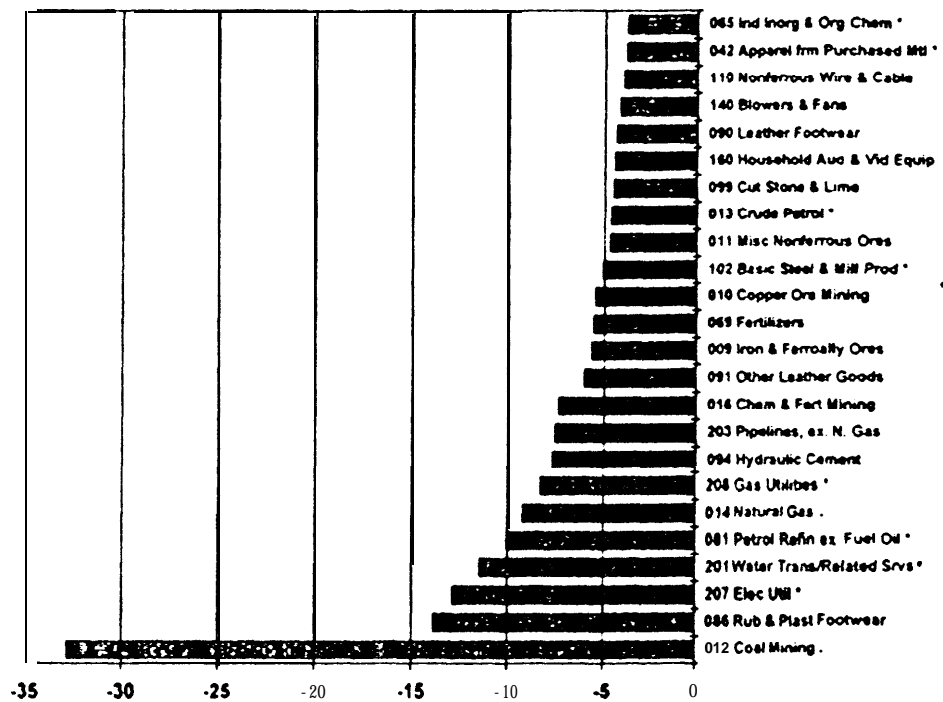


Exhibit 4
Impact of Carbon Permits on Industry Output, Top 25
Case 2: % Difference from Base Case, 2020

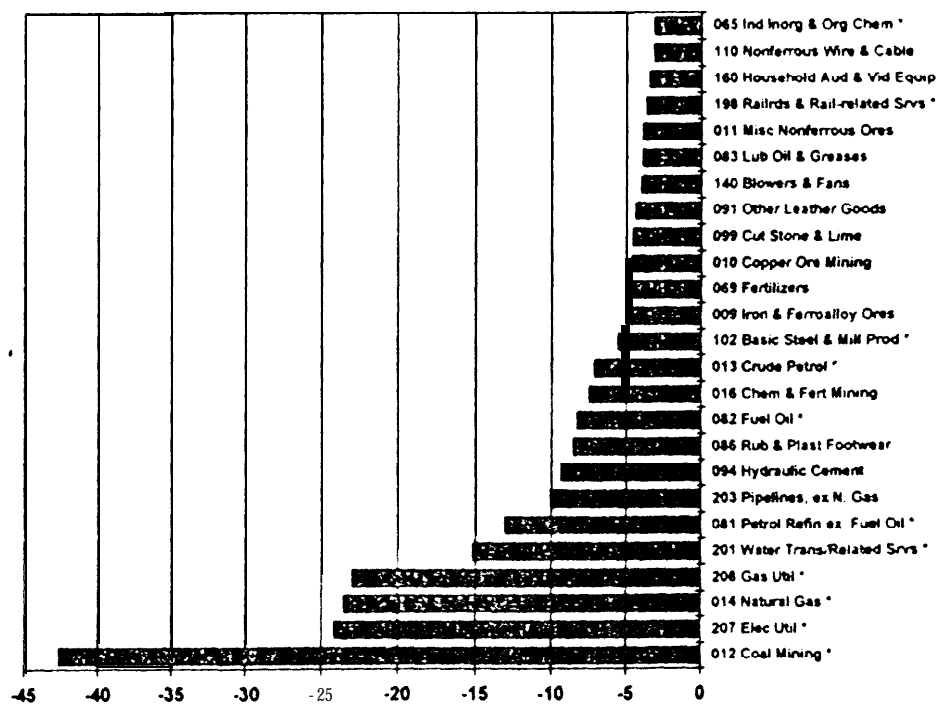


Exhibit 5
Employment Impacts—Manufacturing
Case 2: % Difference from Base Case, 2005

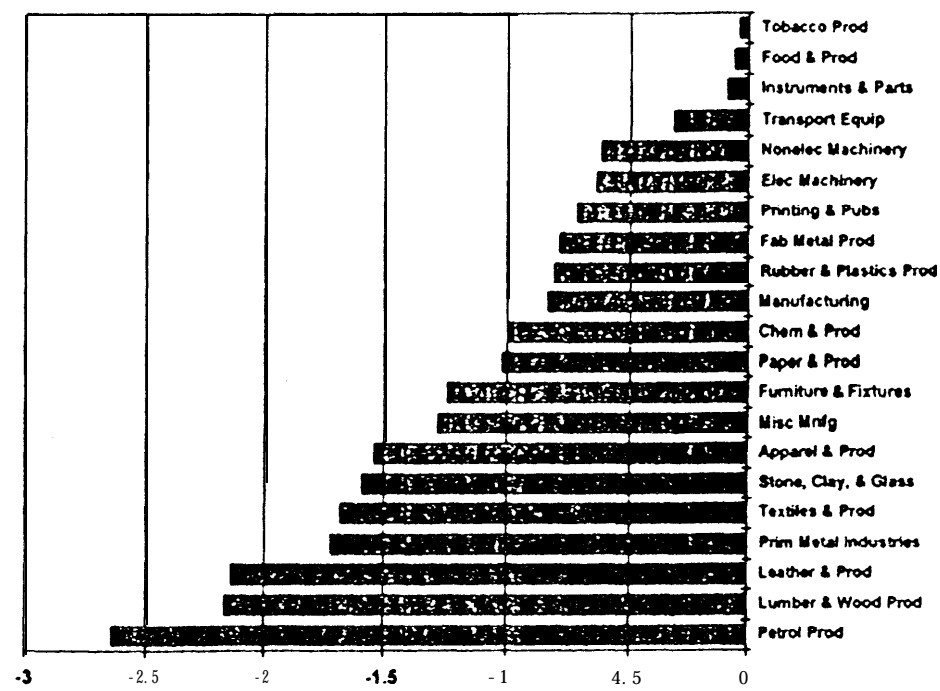


Exhibit 6
Employment Impacts—NonManufacturing
Case 2: % Difference from Base Case, 2005

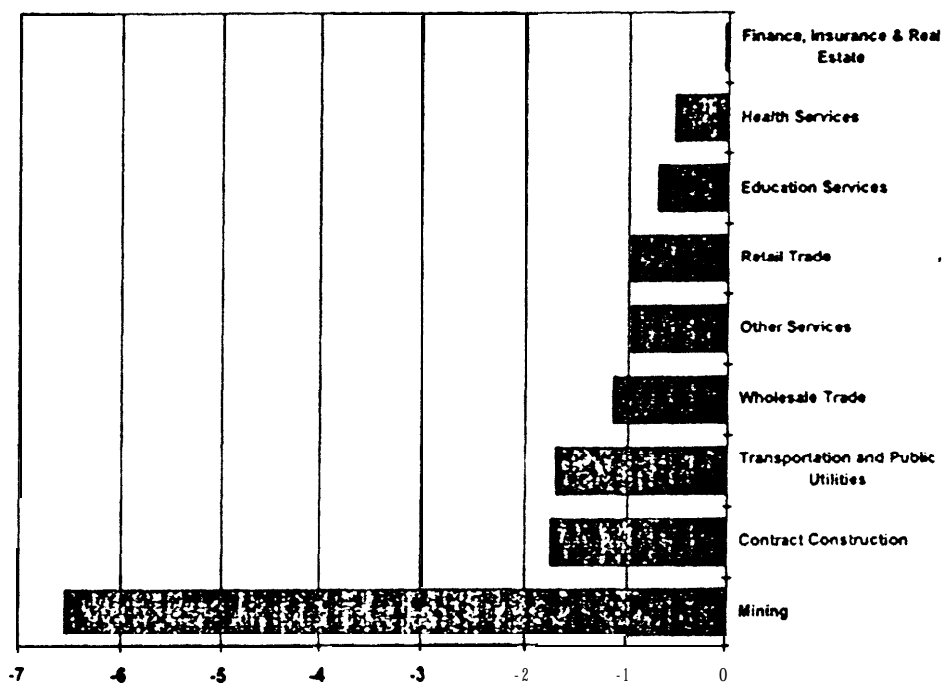


Exhibit 7
Employment Impacts-Manufacturing
Case 2: % Difference from Base Case, 2010

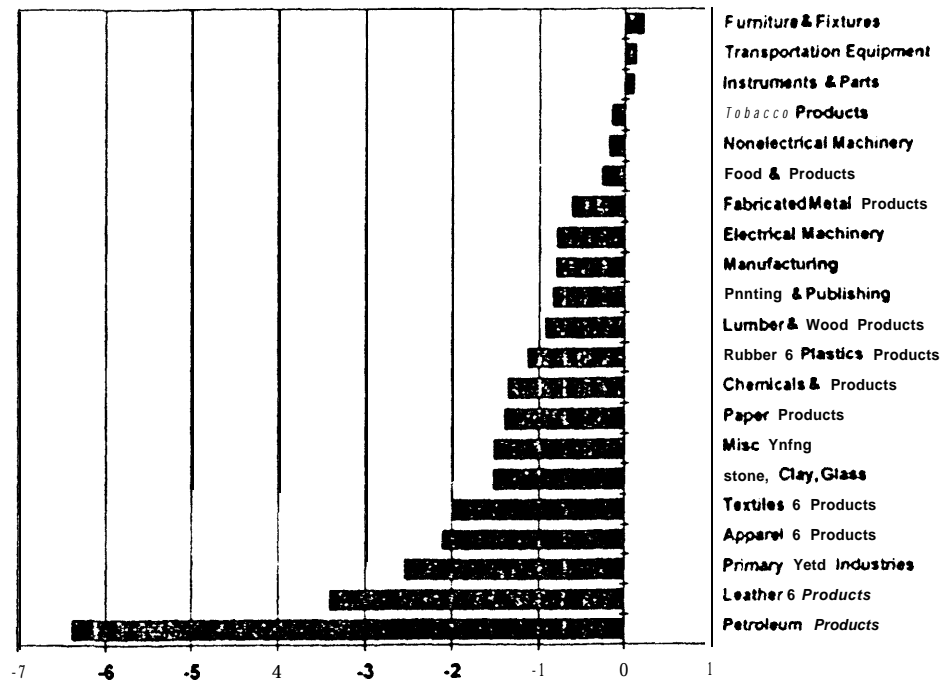


Exhibit 8
Employment Impacts—NonManufacturing
Case 2: % Difference from Base Case, 2010

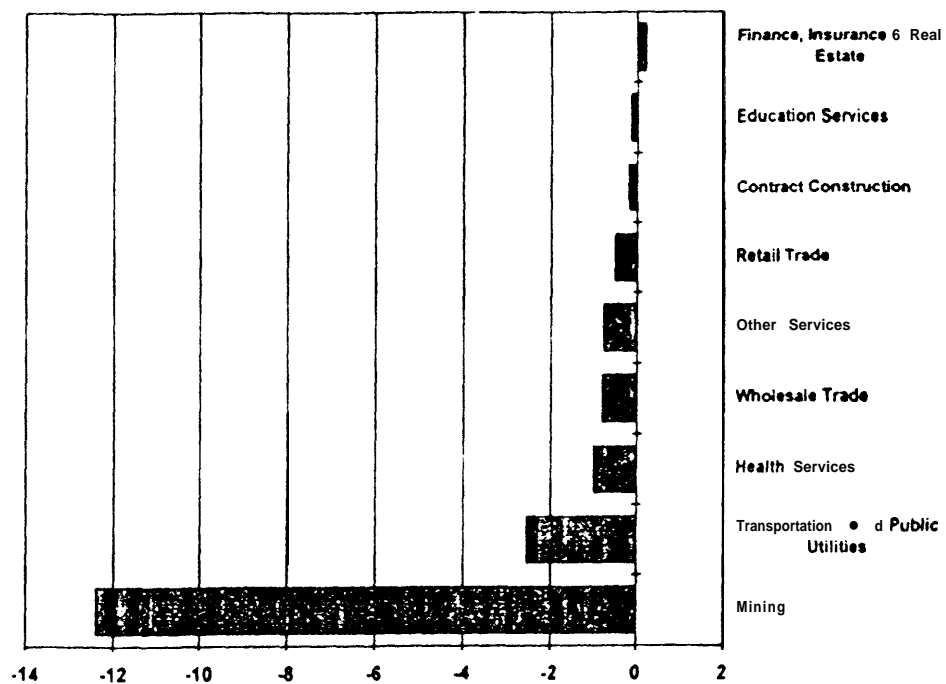


Exhibit 9
Employment Impacts-Manufacturing
Case 2: % Difference from Base Case, 2020

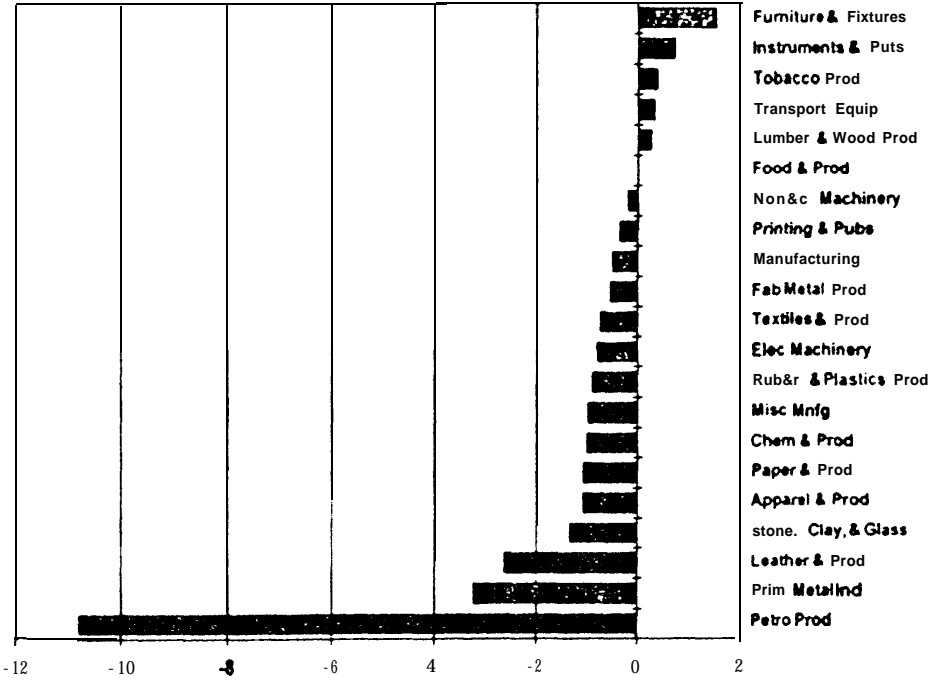


Exhibit 10
Employment Impacts—NonManufacturing
Case 2: % Difference from Base Case, 2020

